Small-scale aquaculture development model for rural Nepal

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Abstract

The majority of rural farmers in Nepal are small holders and their livelihood is based on agriculture. Three projects on small- scale aquaculture, with focus on women's involvement, were completed in Kathar and Kawasoti Village Development Committees (VDCs) of Chitwan and Nawalparasi districts, respectively during 2000-2007. Based on the experience from these projects, guidelines/ steps for the development of small-scale aquaculture in rural areas were drawn. They include: (i) selection of technically feasible site; (ii) identification of appropriate rural society/ ethnic group; (iii) formation of homogenous fish farmers' groups; (iv) registration of these groups with District Agriculture Office; (v) involvement of household heads (both male and female) in training and other activities; (vi) providing technical and input support for one culture cycle; (vii) organizing regular monthly meeting of fish farmers' groups to discuss on-going and upcoming activities, with an emphasis on women; and (viii) establishment of fish farmers' cooperative and its registration with District Cooperative Office. Small-scale aquaculture should be developed in clusters or groups and not in a scattered pattern. Emphasis on "one household-one pond" wherever possible provides an opportunity to form clusters.

Keywords: Aquaculture; Small-holder farmers; Rural livelihood; Woman's involvement; Nepal

1. Introduction

Small-scale aquaculture is the farming of aquatic organisms by small-scale farming households, using mainly extensive and semi- intensive husbandry for household consumption and/or income generation (Edwards and Demaine, 1977). It is further defined as part of subsistence farming with low or no input and with little or no routine management (Wilson, 2005). Small-scale farmers are resource-poor and big pond (>300 m^2) may face input limitation, causing low productivity (Bhujel et al., 2002a,b; Bhujel et al., 2004; Bhujel and Shrestha, 2007). The majority of rural farmers of Nepal are small holders and subsistence in nature. Farming is characterized by integration of crops with livestocks, and livestocks are mostly sold for cash income. Aquaculture is a relatively new farming activity in the country, although a number of ethnic minority communities across the country have traditionally made their living (partially/fully) from capture fisheries. Over the years, it has developed as the fastest growing food production sector in Nepal. However, local fish supplies have been extremely inadequate to meet the increasing demand for fish and fish products. The country imports such products in substantial quantities from India (Tiwari, 2009). Integration of pond aquaculture in existing crop-livestock-based farming system is believed to be effective in increasing local fish supply and diversifying livelihood options of small-holder farmers in southern plains (Terai) and mid-hill valleys, thereby increasing the resilience of rural livelihood.

Increasing food and nutrition security, augmenting cash income for household expenses and utilization of family labor are the major issues of the rural poor. The role of small-scale aquaculture in household food and nutrition security, income generation and empowerment of women and marginalized communities has been increasingly appreciated in recent years. Fish has been considered as "Living Cash" and a pond is "Savings Bank" because fish can be caught and sold whenever cash is needed (Bhujel et al., 2008). However, small-holder farmers will be vulnerable if new projects fail to cope with their daily livelihood, and hence such projects need to be implemented carefully so that the activities would continue and be sustainable beyond the project period. In this paper, we present outcomes of three small-scale aquaculture projects implemented in rural Nepal and attempt to suggest steps to be followed for the success of a small-scale aquaculture development project in the country

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2. Project implementation and outcome

Three projects on small-scale aquaculture were completed in Kathar and Kawasoti Village Development Committees (VDCs) of Chitwan and Nawalparasi districts, respectively during 2000-2007. These projects were: (i) Involvement of women in aquaculture to improve nutritional status and generate supplemental income for farm families (Women in Aquaculture - Phase I); (ii) Involvement of women in aquaculture with vegetable gardening to improve nutritional status and generate supplemental income for farm families (Women in Aquaculture - Phase II); and (iii) Community Fish Production and Marketing Project (CFPMP - Phase III) (Bhujel et al., 2002 a,b; RIDS, 2007).

2.1. Women in aquaculture - phase I (2000-2002)

This project was designed for small-scale farmers with the objectives of: (i) "one household-one pond" with an average size of 100-200 m^2 built near the house; (ii) woman member of household to have access to and control over the pond; (iii) fish produced in the pond mainly to be used for household consumption to improve family nutrition; and (iv) surplus fish to be sold to supplement household income. The project was initiated in 2000 at Kathar, Chitwan, Nepal - jointly by Institute of Agriculture and Animal Science (IAAS), Chitwan, Nepal and Asian Institute of Technology (AIT), Pathumthani, Thailand. It was funded by Women's World Day of Prayer (WDP)-German Committee.

The site selection was based on its appropriateness for pond construction, perennial availability of water (gravity flow canal water from river) and a fish-eating ethnic community known as Tharus as its inhabitants. Twenty-one households showed their interest to participate in the project. The project team carried out various activities on a regular basis, with the involvement of participating households. The sequential activities conducted were:

- Meeting was organized with both male and female heads of the participating households. This provided them a good understanding of the project and secured approval from them to be selected as project participants.
- Both the household heads were involved in training on fish farming and acquired relevant knowledge. This helped women to get support and help from their male counterparts as and when needed.
- Most of the ponds were constructed either by using own household labor or getting help from other households. The project supported 50% of the pond construction cost as calculated based on total labor use.
- Supply of fish seed to the participating households was supported by the project for the first year only. In the later years, representatives of the fish farmers were helped to procure and transport fish seed from seed center to the ponds so that they could do it themselves.
- Monitoring was done regularly during the culture period. Pond condition, fertilizer and manure application, and feed application were observed monthly during field visits and meetings.

The outcomes of the project are presented in detail in Table 1 (Bhujel et al., 2002a)

Table 1
Outcomes of Women in Aquaculture - Phase I (2000-2002)

Particulars	Kathar, Chiwan
Pond constructed (No.)	21
Pond size (m^2)	60 - 395
Total pond area (m^2)	3,683
Total fish production (kg)	1,096
Mean fish productivity (ton/ha)	2.98
Production range (kg/pond)	28.5 - 97
Total home consumption (kg)	436
Consumption range (kg/household)	10 - 45
Total fish sales (kg)	660
Sales range (kg/household)	9 - 67
Total supplemental income (NRs)	53,455
Supplemental income range (NRs/household)	630 - 6,030

2.2. Women in aquaculture - phase II (2002-2004)

After the completion of its first phase, the project entered in second phase (2002-2004), with the continued support from the donor. This phase focused on integration of fish farming with vegetable farming in the pond dykes, with the objectives of: (i) producing fish and vegetables using resources available on the farm; (ii) generating family income by selling the surplus ; and (iii) utilizing family labor (women) for the production.

The process followed was similar to that of Phase I. The project was extended to the adjoining villages of Kathar (Phase-I) and also to Kawasoti VDC of neighboring Nawalparasi district. In this phase, 56 new ponds were constructed. In addition, 21 on-going fish ponds of Phase I were also monitored. The detailed outcomes of Phase II are provided in Table 2.

Table 2
Outcomes of Women in Aquaculture - Phase II (2002-2004)

Particulars	Kathar, Chitwan	Kawasoti, Nawalparasi	Total
Total pond constructed (No.)	57	30	77
Pond size (m^2)	50 - 398	30 - 220	30 - 398
Total pond area (m^2)	8173	2667	10840
Total fish production (kg)	2712	534	3246
Mean fish productivity (ton/ha)	3.3	2.0	2.99
Production range (kg/pond)	5 - 205	7 - 35	5 - 205
Total home consumption (kg)	820	166	986
Consumption range (kg/household)	5 - 40	1 - 15	1 - 40
Total fish sales (kg)	1892	368	2260
Sales range (kg/household)	0 - 180	5 - 25	0 - 180
Total supplemental income (NRs)	227,040	44,160	271,200
Supplemental income range (NRs/household)	0 - 21,600	600 - 3,000	0 - 21,600

- Eight new ponds were constructed without any support from the project.
- In general, a third of the production was used for family consumption and the remaining two-thirds were sold for supplemental income.
- Vegetables (okra, beans, tomatoes, taros, ginger, cucurbits and turmeric) and fruit (bananas) produced in the pond dikes were not sold.

2.3. Community fish production and marketing project (CFPMP) - phase III (2004-2007)

CFPMP was developed as Phase III of the Women in Aquaculture project in the same sites as the previous two projects - Kathar, Chitwan and Kawasoti, Nawalparasi. The project focused on polyculture of carps/tilapia with freshwater prawn with the objectives of: (i) developing fish and prawn production through a cooperative network; and (ii) increasing household income and improving nutritional status of the community members, particularly women and children.

The majority of the participating households mobilized their household labor force to excavate farm ponds. CFPMP provided technical support in planning, layout and construction. Besides, the project also provided partial support to cover the costs of labor, fish seed and construction materials. Pond size varied with the variation in resource base (land and labor) and willingness of the participating households to convert their agricultural lands into fish ponds. All the households stocked fingerlings upon fertilizing their ponds for a few weeks after excavation. Fish species stocked included Tilapia, carps and freshwater prawns.

Table 3
Outcomes of Community Fish Production and Marketing Project - Phase III (2004-2007)

Particulars	Kathar, Chitwan	Kawasoti, Nawalparasi	Total
Total pond constructed (No.)	33	28	61
Pond size (m^2)	63 - 696	40 - 255	40 - 696
Total pond area (m^2)	7419	3242	10661
Total fish production (kg)	2557	762	3319
Mean fish productivity (ton/ha)	3.45	2.35	3.11
Production range (kg/pond)	20 - 340	12 - 90	12 - 340
Total home consumption (kg)	1258	227	1485
Consumption range (kg/household)	4 - 135	3 - 23	3 - 135
Total fish sales (kg)	1300	536	1836
Sales range (kg/household)	5 - 205	4 - 67	4 - 205
Total supplemental income (NRs)	156,000	64,320	220,320
Supplemental income range (NRs/household)	600 - 24,600	480 - 8,040	480 - 24,600

- About 30-50% of the fish produced were used for household consumption and 50-70% were sold for supplemental income.
- About 17 kg of freshwater prawns were harvested from the 12 ponds of Kathar, out of which 50% were consumed and the rest were sold.
- The possibility of carp/tilapia polyculture with prawn was demonstrated.
- Two women fish cooperatives were established.

3. Conclusion

The pilot projects implemented in Chitwan and Nawalparasi have been successful in demonstrating the viability of small-scale aquaculture systems in Nepal. Whilst Millennium Development Goals (MDGs) calls for halving the population living in extreme poverty by 2015, harnessing small-scale aquaculture development potential of Nepal could contribute significantly to meeting these goals. The results of these projects have shown that small-scale aquaculture can bring significant impact on household nutritional status.

About 30-50% of the fish produced were consumed by the households and the remaining was sold for supplemental income. Thus, small- scale pond aquaculture is an effective tool for improving household nutrition and generating supplemental income, thereby helping in poverty reduction.

Establishment of women fish cooperatives played key role in strengthening their organizational capacity. Hence, small-scale aquaculture can contribute greatly to women's empowerment. Replication of such projects is likely to benefit a large number of poor women farmers across Terai and mid-hill valleys of Nepal.

However, small-scale aquaculture should be developed in clusters or groups rather than scatterd. Emphasis on "one household-one pond" (wherever possible) provides an opportunity to form clusters. Formation of fish farmers' groups helps to establish linkage with government offices. It gives them power to demand services and supports. Formation of cooperative further strengthens the groups and individual farmers to be more equipped and to get supports from developmental organizations.

Based on the experience from the above three projects, an approach to the development and establishment of small-scale aquaculture in rural Nepal can be described as: "an aquaculture activity carried out by a family/ household as a component of its farming systems for increasing household nutrition through fish consumption and supplemental income from the sale of the surplus for the improvement of livelihood of resource-poor rural households". To achieve the goal of small-scale aquaculture as described above and for the successful implementation of such projects, guidelines/ steps have been developed (Table 4).

Table 4
Guidelines/steps for developing small-scale aquaculture in rural Nepal

1. Selection of technically feasible site;
2. Identification of appropriate rural society/ ethnic group;
3. Formation of homogenous fish farmers' groups;
4. Registration of these groups with District Agriculture Development Office;
5. Involvement of household heads (both male and female) in training and other activities;
6. Providing technical and input support for one culture cycle;
7. Organizing regular monthly meetings of fish farmers' groups to discuss on-going and up-coming activities, with an emphasis on household women; and
8. Establishment of fish farmers' cooperative and its registration with District Cooperative Office.

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